FURTHER DESCRIPTION OF THE ANIMAL OF *DAMAYANTIA CARINATA*, COLLINGE, SHOWING ITS SIMILARITY TO *D. SMITHI*, COLLINGE & G.-A., WITH REMARKS ON THIS GENUS OF ISSEL, *COLLINGEA* OF SIMROTH, AND *ISSELENTIA* OF COLLINGE.

By Lieut.-Colonel H. H. Godwin-Austen, F.R.S., etc.

Read 13*th March*, 1903.

PLATE XI.

A specimen labelled "*Damayantia carinata*? Collinge," has been kindly entrusted to me for dissection by Mr. Edgar Smith, of the British Museum (Natural History). It is the smallest of three sent from North Borneo by Mr. Shelford, and is the first Bornean slug-like mollusc I have as yet seen in which the external form, and proportion of the parts to one another, correspond closely with Issel's figure of *Damayantia dilecta* (*1*). Anyone making the comparison can feel very certain he has a representative species of Issel's genus to deal with. When I joined Mr. W. Collinge in writing a paper on Bornean slugs in 1895 (*2*), the one species then placed in the genus, viz. *Damayantia Smithi*, was not quite so strikingly like *D. dilecta*, a single example of which I have also lately examined at the British Museum. *D. carinata*, the subject of this paper, I consider is very close to the type. It should be borne in mind that in representations of these animals preserved in alcohol, the spread of the mantle-lobes over the shell is largely dependent (1) on the freshness of the animal when put into the spirit, (2) on the shrinking and crinkling they at once undergo.

I propose, in the first place, to describe the animal of *D. carinata*, and then to make some remarks both on the previous work by Mr. Collinge and myself in 1895 and on some of that which Mr. Collinge has since done.

The length of the specimen of *D. carinata*, which was received by the British Museum in 1902, is 26 mm. It is not a fully grown example, but is in fair preservation. Its most striking external character is the extremely long narrow foot, posteriorly much compressed at the sides and rising into a sharp dorsal keel, which terminates in an overhanging small lobe above a small mucous gland. (Pl. XI, Figs. 1 and 1*a*.) In this specimen there is no sign whatever of the jagged or toothed appearance of the keeled foot observed in the specimen of *D. carinata* described by Mr. Collinge. This appearance may therefore be due to epidermal destruction, produced by muscular splitting strain. As is well known by those who have collected these exotic slugs, and noticed by Semper and others, some species fling the tail right and left with great force and rapidity when they are touched, and will thus throw themselves off the hand; such action might readily split the very sharp line of the keel and the resultant fractures be intensified in the spirit. In such case it would not be a structural character to be used in a specific sense. The sole is divided into a central and side areas.

The general colour of the animal is pale ochraceous throughout,

with a dark shade over the extremity of the foot, commencing just behind the visceral mass, where the keel rises, and extending diagonally to the mucous gland; this shade of colour is intensified along the line of the keel just below the pale margin, and again on the lower margin. The upper surface of the mantle is pale grey. The peripodial margin is of the same colour as the rest of the body, with three grooves above it (Fig. 1*c*; see also (*2*) pl. xi, fig. 6, and (*3*) pl. lxxiii, fig. 4 [1]). The visceral sac is situated well forward, and the mantle completely covers the shell. There is a raised bank-like ridge on the right posterior margin, commencing just behind the respiratory orifice, continuing round to the back of the visceral mass, and meeting another on the left side. Between these right and left ridges, the shell area is flattish, and a slight median fold is seen in the centre of it. On cutting and turning back the mantle the extremely thin membranaceous rudimentary shell is exposed to view, and the apex of the visceral sac is seen through it (Fig. 1*b*). In this specimen the shell did not extend beyond this in a posterior direction, and there was, therefore, not the slightest indication of an apex to the shell.

The eye and oral tentacles are well seen; in this spirit specimen the mouth (Fig. 1*c*) is extended and protruded forward, disclosing the jaw, and is surrounded by a circle of globose tubercles. In Fig. 1*c* are also shown the three peripodial grooves, which are not easily made out near the extremity of the foot, owing to some loss of the surface in the spirit.

The buccal mass is spherical, the radula very broad, and under a moderate power of a beautiful delicate gauzy texture. Further examination shows an enormous number of close-set, elongate teeth, all very similar in shape, in each row (Fig. 1*g*), only differing by becoming shorter towards the margin, the formula being:—

204 : 1 : 204.

The centre tooth is evenly tricuspid, long, and narrow, the laterals are evenly bicuspid, the outer cusp being slightly the larger, the outermost teeth are evenly tricuspid. The jaw (Fig. 1*f*) is straight in front, with a slight concavity in the middle.

Unfortunately, I did not secure the generative organs complete. The penis was broken off, as also was the spermatheca. The amatorial organ (Fig. 1*d*) remained with the oviduct and part of the vas deferens. The form of the amatorial organ is like that of *Damayantia Smithi*; it is bent on itself, and the calcareous dart was found. What is seen agrees with the corresponding parts found in former dissections of that

---

[1] With regard to these two sets of drawings, there is this difference to be noted between them: those on plates lxxiii–lxxv, "Land and Fresh-water Mollusca of India," are my original drawings, made on autographic paper at the time the dissections were in hand, and eventually transferred to stone; those on plates xi–xiv in the Proc. Zool. Soc. were copied from them and put on stone by Mr. Smit—they have lost a little owing to the fact that this draughtsman was not acquainted with the subject he was drawing and did not have the dissections before him. All the figures on plate lxxiii are from the specimen of *Damayantia Smithi*, and the generative organs (figs. 7–7*d*) compare well with the drawings made by Mr. Collinge (pl. xi, figs. 9, 10) from his dissections.

species, and with Mr. Collinge's description and drawing for *D. carinata* (*4*, p. 299, pl. ii, fig. 23). A portion of the vas deferens, including an immature spermatophore, is also preserved (Fig. 1*e*).

The characters of the odontophore and of the jaw (not described by Mr. Collinge) constitute very important points, agreeing as they do with the original description (*2*, p. 243) of those occurring in *D. Smithi*, and with the figures on (*3*) pl. lxxiii, figs. 5, 6, and the copies of them on (*2*) pl. xi, figs. 7, 8. These characters in the genus *Damayantia* at once separate it widely and conclusively from other associated slug-like species, which fall into the genus *Parmarion* and its subgeneric divisions, *Microparmarion*, *Collingea*, etc.

Mr. Collinge writes (*4*, p. 297):—"In 1895 (*3*), in conjunction with Lieut.-Col. H. H. Godwin-Austen, I described a new species of *Damayantia* from Borneo, and two new species of *Microparmarion*, Simr. All three, however, were generically wrongly assigned. For the latter two Simroth (*5*) has constituted a new genus *Collingea*, and *in this the former must now be placed*." I take exception to this conclusion.

Again (*4*, p. 303), under the genus *Collingea*, the following occurs:—"In 1895 (*3*) I described, in conjunction with Lieut.-Col. H. H. Godwin-Austen, a slug-like mollusc from the Poeh Mountains, Sarawak, to which the name *Damayantia Smithi* was given. At that time I had not seen Issel's description (*1*) and figures of *D. dilecta*, but Lieut.-Col. Godwin-Austen was of opinion that the specimens from the Poeh Mountains belonged to Issel's genus. Having recently seen a specimen of *D. dilecta* and compared it with Issel's description and figures, *I have no hesitation in at once removing the specimen named D. Smithi from that genus*. Through the kindness of Mr. Edgar A. Smith I have had the opportunity of examining this very interesting mollusc, and am now able to give an emended description of it and some further particulars respecting its internal structure." The conclusion indicated in italics is a somewhat hasty one to arrive at, and it seems to me there is here both confusion of species and ideas, due in the first place to our writing a joint paper, one of us in Birmingham, the other in Surrey, and never comparing together, then or since, the material we were working at; secondly, to the subsequent misplacing of those species in the bottles in the British Museum. Any resorting or any change of the original nomenclature, that might have become necessary, should have been made in concert and after due consultation and agreement. To satisfy myself I have lately, thanks to Mr. Edgar Smith, also looked over the material in question and found three jars labelled respectively:—

No. 1. "95–9–18 (sp. 5, 6, 7). *Damayantia Smithi*."—This jar contained only *one* specimen of what I take to be *Microparmarion Simrothi*, certainly not *Damayantia*.

No. 2. "95–9–18 (sp. 3, 4). *Microparmarion Polloneraï*."—This contained two specimens of this species, together with the generative organs. These agree with those drawn by me (*3*, pl. lxxv, fig. 7), and also with Mr. Collinge's drawings (*2*, pl. xiii, figs. 22, 23).

No. 3. "95–9–18 (sp. 1, 2). *Microparmarion Simrothi*."—In this last was found, (*a*) the shell, animal, and generative organs of

M. Simrothi; (*b*) the shell and animal of *D. Smithi*, but the generative organs were not found—such extremely small dissections have every chance of being lost, unless placed in separately labelled small glass tubes. The generative organs of *M. Simrothi*, on re-comparison, agree both with my drawings (*3*, pl. lxxiv, figs. 5, 5*a*) and Mr. Collinge's (*2*, pl. xiii, figs. 32–34). The shell and what remains of the animal of *Damayantia Smithi* also agree well with my drawings (*3*, pl. lxxiii, figs. 2, and 1, 1*a*, 1*b* respectively). The shell 1 recognized as the very same which I removed from the animal of that species. Most fortunately I have in my collection of radulæ (now in the Natural History Museum) the one taken from the typical specimen of *D. Smithi* (Pl. XI, Fig. 2*c*), and supposing the generative organs be set on one side, I maintain that no confusion of species has occurred. Mr. Collinge, at the top of (*4*) p. 304, says, regarding the species sent him originally by Mr. Smith, "one of these Godwin-Austen figured (*3*, pl. xi, figs. 1–6) . . . ." These figures include the animal and shell, but he omits to mention figs. 7, 8, and 12, viz., the jaw, radula, and calcareous dart respectively of the same animal I dissected; the first two, 7 and 8, are the most important characters in this question of identity, and alone dispose of the remainder of the above quoted sentence, "which undoubtedly belongs to the genus *Collingea*, Simroth." Having removed the species *Smithi* from *Damayantia*, I turn next to what Mr. Collinge writes on (*4*) p. 304, under its new position of *Collingea Smithi*; a few words of the original description of the animal in the Proc. Zool. Soc. are quoted in a footnote, and fault is found with my drawing of the animal of *Damayantia Smithi* (*2*, pl. xi, figs. 1, 2). It is put very bluntly, "the figure is wrong in showing this," referring to a black streak on the side of the foot. Does Mr. Collinge really suppose the black streak in figs. 1, 1*b* (*3*), or figs 1, 2 (*2*), was put in by way of adornment? It would have avoided much confusion and all this writing, had Mr. Collinge looked over these Bornean species in the three jars with me, before creating new species and genera. The black streak cannot be eliminated in this way, for it occurs not only in the drawing but also in the description; neither can the radula (fig. 8), the jaw (fig. 7), nor the shell (fig. 4), (*2*, pl. xi). All this is most important evidence that the species named after Mr. Edgar Smith in 1895 cannot certainly belong to the genus *Collingea*. In both the Bornean species it may be noted that the radula is not in the least like that of *Damayantia Smithi*. Simroth created the genus *Collingea* in August, 1897 (*5*), and made it a second genus of his *Microparmarion* group of the Malayan slug-like forms, further divided by him into two subgenera—(1) *C. Strubelli* of Java, (2) *C. Pollonerai* and *C. Simrothi* of Borneo—the only subgeneric distinction being a slight difference in the form of the mantle-lobes. The reasons for forming this genus distinct from *Microparmarion* are to be found in the above excellent paper by Professor Simroth. Unfortunately, he does not describe the subgenus in full, but brackets two species together, which on close inspection of the anatomy do not agree, more particularly in the form of the penis (*vide 2*, figs. 22–24 of *Microparmarion Pollonerai*, and figs. 32–34, *Microparmarion Simrothi*). The first

named, *Pollonerai*, I accept and consider to be the type of the subgenus *Collingea*, though rather as a subgenus of *Parmarion*, and not of *Microparmarion*, a typical Javan genus, for this last I consider to be more appropriately another subgenus of *Parmarion*. I have very lately again examined the generative organs of both *Pollonerai* and *Simrothi* (types) at the Natural History Museum. For want of more material *Simrothi* must for the present remain in *Microparmarion*; and next looking at the figures (*4*, 34, 35, 36, pl. ii) of the generative organs of Collinge's *Collingea Smithi* I came to the conclusion he had a specimen of *Microparmarion Pollonerai* in hand, and not the *Damayantia Smithi*, as I understood that species in 1895, and understand it now. This investigation has led to the notice of another genus formed by Mr. Collinge for the reception of Bornean slug-like molluscs, viz. *Isselentia* (*4*, p. 305), and noting (p. 307) that the type of *Isselentia globosa*, Collinge, was to be seen in the Natural History Museum, I, with Mr. Edgar Smith's kind aid, found a jar labelled *Isselentia plicata*, Collinge, containing two specimens from the Poeh Mountains, Sarawak. It bore the date 1895, 9, 18, and on looking up the entries of this period in the Museum Register, it corresponded to the presentation in that year by Mr. Everett of the three species previously noticed and examined by me. The jar contained two specimens, one from which the generative organs, etc., had been extracted, and one perfect specimen. I at once recognized these to be *Damayantia Smithi*, and a comparison with my drawings of that animal (*3*, pl. lxxiii, figs. 1, 1*a*, 1*b*) confirms me in the correctness of this identification. I give a drawing of one of these (Pl. XI, Figs. 2, 2*a*), and have extracted the radula, which is exactly like that of *D. Smithi* (Fig. 2*c*). These two specimens labelled *Isselentia plicata* are, in fact, the typical *Damayantia Smithi* sent home by Everett, and they should be placed in jar No. 1, which has this title, with the shell I found in jar No. 3.

Although labelled *Isselentia plicata*, I believe these represent Mr. Collinge's species *Isselentia globosa* (*4*, p. 307). He says the differences are extremely small, "animal smaller, but not at all unlike *I. plicata*"; further on, "When recently examining these two specimens I felt inclined to refer them to *I. plicata*, but an examination of the generative organs shows that they exhibit some important differences" (*4*, pl. iii, fig. 50). On searching for these differences in this figure I was struck by its wonderful similarity to (*2*) fig. 9, pl. xi, and on superimposing a tracing of this last upon it, it is absolutely the same in all its parts, with the exception of the penis; this organ in fig. 50 is longer and of somewhat different outline, and the proportion of its length to the length of the amatorial organ differs in the two figures, in fig. 50 it seems too long. They may both, however, be compared with my drawing of the genitalia of *Damayantia Smithi*, (*3*) pl. lxxiii, figs. 7, 7*a*, 7*b*, made in 1895, and more particularly to the form of the penis in figs. 7*a*, 7*b*, and 10 by Mr. Collinge (*2*, pl. xi).

I have already referred to changes of the soft parts produced in alcohol. Mr. Collinge in *Isselentia plicata* shows in (*4*) pl. i, fig. 15, that the keel of the foot is crinkled up; this is seen as an uneven jagged edge in profile (*4*, figs. 13, 14), described as a wavy keel of a deep yellow

colour; the waviness points merely to the foot being much longer in life. Similar contraction is shown and described as a specific character on the edge of the mantle This can, I imagine, be only a *post mortem* state due to great contraction, and in all probability would not be seen in the living animal, or in one killed in water and then put into spirit. However, there is no necessity for the creation of another genus, viz. *Isselentia*, for Bornean slugs. All the species I have as yet seen fall into two well-marked divisions:—

1. *Damayantia*, with its very peculiar radula (Pl. XI, Figs. 1*g* and 2*c*).

2. *Collingea*, formerly *Microparmarion*, with a radula of the type of *Parmarion*.

Isselentia is more probably a subgenus of *Damayantia*, if that genus is to be subdivided, and is distinguished by having the mantle-lobes less developed, while those of *D. dilecta* and *D. carinata* have coalesced or grown together, as shown in Pl. XI, Figs. 1, 1*a*, 2, and 2*a*.

Neither Mr. Collinge nor myself have had the advantage of seeing any of these Bornean slugs alive, and it is not a matter of any very great importance whether *D. Smithi*, *D. plicata*, and *D. globosa* are different species or not.

REFERENCES.

1. *Issel* (*A.*).—"Molluschi Borneensi": Ann. Museo Civico Genova, vol. vi (1874), pp. 366–486, pls. iv–vii.
2. *Collinge* (*W. E.*) and *Godwin-Austen* (*H. H.*).—"On the structure and affinities of some new species of Molluscs from Borneo": Proc. Zool. Soc., 1895, pp. 241–250, pls. xi–xiv.
3. *Godwin-Austen* (*H. H.*).—"Land and Fresh-water Mollusca of India," vol. ii, pt. 8 (1898), pp. 55–60, pls. lxxiii–lxxv.
4. *Collinge* (*W. E.*).—"On the anatomy of a collection of Slugs from North-West Borneo": Trans. Roy. Soc. Edinburgh, vol. xl (1902), pp. 295–312; 3 pls.
5. *Simroth* (*H. R.*).—"Ueber die Gattungen *Parmacochlea*, *Parmarion*, und *Microparmarion*": Zool. Jahrb., Bd. xi, Syst. (1898), pp. 151–172, pl. xv.

EXPLANATION OF PLATE XI.

Damayantia carinata.

Fig. 1. Animal, viewed from the right side. × 2·3.
,, 1*a*. Animal, viewed from the left side. × 2·3.
,, 1*b*. Animal, viewed from above, the mantle and shell removed to show visceral sac. × 4·5.
,, 1*c*. Left side of head, showing mouth and the three peripodial grooves. × 8.
,, 1*d*. Part of the generative organs. × 4·5.
,, 1*e*. Portion of a spermatophore. × 58.
,, 1*f*. Jaw. × 24.
,, 1*g*. Median, adjacent, and three outside teeth of the radula. × 1,100.

Damayantia Smithi.

Drawn from a specimen in Nat. Hist. Museum, labelled "*D. plicata*, 95–9–18."

Fig. 2. Animal, viewed from the right side. × 2·5.
,, 2*a*. Animal, viewed from the left side. × 2·5.
,, 2*b*. Jaw. × 12.
,, 2*c*. Median and adjacent teeth of the radula. × 550.